

WHAT IS CLAIMED IS:

1                   1.     A rotating actuator comprising:  
2                   a shaft rotatable in clockwise and counter-clockwise directions of  
3 rotation; and  
4                   an activatable mechanical stop device for generating a stop to limit  
5 the rotation of the shaft in one of or the other one of the directions of rotation;  
6                   the mechanical stop device including first and second independently  
7 triggered stop arrangements that act mechanically on the control shaft, wherein the  
8 first stop arrangement generates a first stop for limiting the rotation of the shaft in  
9 the clockwise direction and the second stop arrangement generates a second stop for  
10 limiting the rotation of the shaft in the counter-clockwise direction.

1                   2.     The rotating actuator of claim 1 wherein:  
2                   the stop device includes an annular element that concentrically  
3 envelops the shaft, the annular element being coupled to the shaft to rotate  
4 therewith, the stop device further including an activation device fixed in place  
5 relative to rotation of the shaft, wherein the activation device activates in order to  
6 block the rotation of the annular element and thereby generate the first and second  
7 stops of the first and second stop arrangements.

1                   3.     The rotating actuator of claim 2 wherein:  
2                   each stop arrangement includes a stop member allocated to one of the  
3 shaft and the annular element and includes a pocket allocated to the respective other  
4 one of the shaft and the annular element, the pocket being open in a radial direction  
5 toward the stop member, the pocket having right and left limits in the directions of  
6 rotation to form the first and second stops which the stop member engages when the  
7 first and second stops are generated.

1                   4.     The rotating actuator of claim 3 further comprising:  
2                   a haptic interface generating device for generating a haptic interface  
3 when the shaft is rotated, the haptic interface generating device including a latching  
4 cam plate and latching elements that engage in the latching cam plate, the haptic

5 interface generating device further including a second activation device operable for  
6 acting on the latching cam plate to enable interaction between the latching elements  
7 and the latching cam plate to generate a haptic interface shaped by the latching cam  
8 plate during rotation of the shaft.

1                   5.     The rotating actuator of claim 4 wherein:  
2                   the second activation device includes a clamping ring which  
3 surrounds and contacts the latching cam plate, wherein the clamping ring fixes the  
4 latching cam plate in place relative to the shaft in order to generate the haptic  
5 interface shaped by the latching cam plate during rotation of the shaft when the  
6 activation device is activated.

1                   6.     The rotating actuator of claim 5 wherein:  
2                   the clamping ring is an electromagnetically actuated clamping ring.

1                   7.     The rotating actuator of claim 4 further comprising:  
2                   a second haptic interface generating device for generating a second  
3 haptic interface when the shaft is rotated, the second haptic interface generating  
4 device including a second latching cam plate and a second latching element that  
5 engages in the second latching cam plate, the second haptic interface generating  
6 device further including a third activation device operable for acting on the second  
7 latching cam plate to enable interaction between the second latching element and the  
8 second latching cam plate to generate a second haptic interface shaped by the second  
9 latching cam plate during rotation of the shaft.

1                   8.     The rotating actuator of claim 7 wherein:  
2                   the latching cam plates are arranged adjacently in different planes  
3 along the longitudinal axis of the shaft.

1                   9.     A rotating actuator comprising:  
2                   a shaft rotatable in clockwise and counter-clockwise directions of  
3 rotation; and

4                   an activatable mechanical stop device for generating a stop to limit  
5                   the rotation of the shaft in one of or the other one of the directions of rotation;  
6                   wherein in order to limit the rotation of the shaft in either one of the  
7                   directions of rotation the stop device includes a stop arrangement which acts  
8                   mechanically upon the shaft to prevent the shaft from rotating further in one of the  
9                   directions of rotation while providing slip to allow rotation of the shaft in the other  
10                  one of the directions of rotation, wherein the slip enables sufficient rotation of the  
11                  shaft in the other one of the directions of rotation for detection by an angle detection  
12                  device.

1                   10.     The rotating actuator of claim 9 wherein:  
2                   the stop device includes an annular element that concentrically  
3                   envelops the shaft, the annular element being coupled to the shaft to rotate  
4                   therewith, the stop device further including an activation device fixed in place  
5                   relative to rotation of the shaft, wherein the activation device activates in order to  
6                   block the rotation of the annular element and thereby generate the stop to limit the  
7                   rotation of the shaft.

1                   11.     The rotating actuator of claim 10 further comprising:  
2                   a haptic interface generating device for generating a haptic interface  
3                   when the shaft is rotated, the haptic interface generating device including a latching  
4                   cam plate and latching elements that engage in the latching cam plate, the haptic  
5                   interface generating device further including a second activation device operable for  
6                   acting on the latching cam plate to enable interaction between the latching elements  
7                   and the latching cam plate to generate a haptic interface shaped by the latching cam  
8                   plate during rotation of the shaft.

1                   12.     The rotating actuator of claim 11 wherein:  
2                   the second activation device includes a clamping ring which  
3                   surrounds and contacts the latching cam plate, wherein the clamping ring fixes the  
4                   latching cam plate in place relative to the shaft in order to generate the haptic  
5                   interface shaped by the latching cam plate during rotation of the shaft when the  
                 activation device is activated.

1                   13.     The rotating actuator of claim 12 wherein:  
2                   the clamping ring is an electromagnetically actuated clamping ring.

1                   14.     The rotating actuator of claim 11 further comprising:  
2                   a second haptic interface generating device for generating a second  
3     haptic interface when the shaft is rotated, the second haptic interface generating  
4     device including a second latching cam plate and a second latching element that  
5     engages in the second latching cam plate, the second haptic interface generating  
6     device further including a third activation device operable for acting on the second  
7     latching cam plate to enable interaction between the second latching element and the  
8     second latching cam plate to generate a second haptic interface shaped by the second  
9     latching cam plate during rotation of the shaft.

1                   15.     The rotating actuator of claim 14 wherein:  
2                   the latching cam plates are arranged adjacently in different planes  
3     along the longitudinal axis of the shaft.

1                   16.     The rotating actuator of claim 14 wherein:  
2                   the activation devices are combined into an assembly.